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Part 1. Hematological Components of the "Greer-Radeleff" Line of American-Essex Swine

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Part 1. Hematological Components of the "Greer-Radeleff" Line of American-Essex Swine

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ABSTRACT

Seventeen hematological components were determined for 25 Greer-Radeleff swine—a breed of American-Essex swine—ranging in age from 4 to 67 months at the start of the study. Individual samples were taken every 28 days for 12 months from 14 female and 11 male swine. The males had a significantly higher erythrocyte count, prothrombin time, and percentage of segmented neutrophils. The females had a significantly higher corpuscular hemoglobin, corpuscular volume, and percentage of lymphocytes. Corpuscular hemoglobin concentration, hematocrit, hemoglobin, basophils, monocytes, and band neutrophils were essentially the same. The female swine had a higher percentage of reticulocytes, partial thromboplastin time, sedimentation rate, and eosinophils, but not significantly so, and the males had a higher leukocyte count. **KEY WORDS: American-Essex swine, hematology of livestock, hematology of swine, normal hematological values of American-Essex swine, swine.**

INTRODUCTION

Swine have been used in biomedical research since as early as 1500, when Leonardo da Vinci used pigs to demonstrate the movement of the heart during the cardiac cycle. Until recent years, however, domestic swine have not been widely used in biomedical research, probably because of their size at maturity and difficulty in handling.

At the Veterinary Toxicology and Entomology Research Laboratory, we needed a pig of an established breed that would both represent swine rather than man and have the primary advantages of a miniature pig (size and economy). The pigs should be docile, productive, and adaptable to the outdoor climate of Southwest Texas. They should breed true, reflect normal biochemical and physiological values, and have normal swine reactions to toxic substances.

At one time a breed known as the American-Essex was raised for food in the ranching areas of Southwest Texas. We found one such herd in 1967 on a ranch in the Hill Country area of West Texas. Established in 1916, the herd had been closed since 1919. The pigs were small and black with a russet tinge in the hair, and they appeared to breed true through natural selection.

Four bred gilts were purchased by the laboratory. We named the offspring Greer-Radeleff, or "G–R," pigs after the owner of the parent stock and the initiator of the revival of the stock, respectively.

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The use animals in biological research requires the establishment of normal values for comparison with the experimentally induced changes. Since the "G–R" swine meet the criteria of a good research animal, 17 normal hematological values for this line of swine are reported in this paper.

EXPERIMENTAL PROCEDURE

We used 14 female and 11 male "G–R" swine ranging from 4 to 67 months of age at the start of the study. Individual blood samples were collected by venipuncture of the anterior vena cava every 28 days for 12 months. For most hematological determinations, EDTA (ethylenediaminotetraacetic acid, disodium salt) was used as the anticoagulant, and sodium citrate was used for the blood obtained for coagulation studies.

The pigs were kept in individual 6- by 8-foot pens on smooth concrete slabs with a galvanized cyclone fence. Each pen contained either a small wooden shelter (commercial doghouse) or a metal shelter (two-can garbage storage unit) of equivalent size. Fresh water was available at all times. Twice a day the pigs were hand-fed a commercial nonmedicated feed containing approximately 14 percent crude protein, those from 4 to 6 months of age getting 300 grams per feeding, those from 6 months to 1 year, 400 grams, and over one year, 500 grams. The ration was basically a sorghum grain and soybean meal mixture containing animal protein products, dehydrated alfalfa-leaf meal, processed grain byproducts, and cane molasses, supplemented with vitamins, minerals, and salt.

Erythrocyte (RBC) and leukocyte (WBC) counts were determined on a model B coulter counter, and packed cell volume was done by the microhematocrit procedure. A Wintrobe Sed-i-rak was used to determine sedimentation rates, hemoglobin levels were determined by the HyCel cyanomethemoglobin procedure, and coagulation studies were done on a BBL automatic fibrometer. Prothrombin times were determined by Quick's one-stage method[2] with an activated rabbit brain thromboplastin. Partial thrombo-

TABLE 1.—*Hematological values of "G–R" pigs*

Component	All animals[1]		Females[2]		Males[3]	
	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.
Mean corpuscular hemoglobin (MCH) .... pg	24.6	1.2	25.2	1.3	23.8	1.2
Mean corpuscular volume (MCV) .... μm^3	68.7	2.3	70.6	2.5	66.7	2.3
Mean corpuscular hemoglobin concentration (MCHC) .... pct	35.7	1.0	35.7	1.0	35.8	0.9
Hematocrit .... vol. pct	43.4	0.9	43.3	1.0	43.5	0.9
Hemoglobin .... g pct	15.5	0.3	15.5	0.3	15.6	0.4
Erythrocytes .... $mm^3 \times 10^6$	6.4	0.2	6.2	0.3	6.6	0.3
Reticulocytes .... pct of RBC[4]	0.9	0.4	1.0	0.5	0.8	0.5
Prothrombin time .... s	10.9	0.4	10.6	0.5	11.1	0.3
Partial thromboplastin time .... s	13.6	1.2	13.8	1.4	13.2	1.1
Sedimentation rate .... mm/h	27.6	6.9	29.7	7.1	26.2	8.8
Leukocytes .... $mm^3 \times 10^3$	13.9	0.9	13.7	0.8	14.1	1.1
Eosinophils .... pct	9.8	2.3	10.6	2.7	8.8	2.8
Basophils .... pct	0.4	0.4	0.5	0.4	0.5	0.4
Monocytes .... pct	2.6	1.3	2.7	1.4	2.5	1.4
Band neutrophils .... pct	0.6	0.7	0.6	0.7	0.5	0.9
Segmented neutrophils .... pct	40.1	3.2	36.6	5.0	44.3	2.9
Lymphocytes .... pct	46.5	3.3	49.1	4.4	43.5	4.1

[1] 279 samples; 13 samples were not taken or lost.
[2] 147 samples; 11 samples were not taken or lost.
[3] 132 samples; 2 samples were not taken or lost.
[4] RBC = Red blood cells.

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[2] Quick, A. J. 1957. Hemorrhagic diseases. 451 pp. Lea and Febiger, Philadelphia.

plastin times were determined with a reagent having cephalin as a platelet factor substitute and cellite for particle activation.

RESULTS AND DISCUSSION

The means and standard deviations of the hematological components for all animals, females, and males are given in table 1. Six of the seventeen components showed a significant (*P*> 0.05) sex difference: the females had a significantly higher corpuscular hemoglobin (MCH), corpuscular volume (MCV), and percentage of lymphocytes, and the males had a significantly higher erythrocyte count, prothrombin time, and percentage of segmented neutrophils. Corpuscular hemoglobin concentration (MCHC) hematocrit, hemoglobin, basophils, monocytes, and band neutrophils were essentially the same for both males and females. The female swine had a higher percentage of reticulocytes, partial thromboplastin time, sedimentation rate, and percentage of eosinophils, but not significantly so, and the males had a higher leukocyte count.

The means of all animals for MCH, MCV, MCHC, hematocrit, hemoglobin, and erythrocytes either closely approximate or fall within the range given in the Handbook of Biological Data.[3] However, these values, with the exception of erythrocytes, are greater than those reported by Earl et al. for 4-month-old Hormel-Hansford strain miniature swine and by Tumbleson et al. for 11-month-old Sinclair (S–1) boars.[4] The erythocyte level was in close agreement with that reported by Tumbleson et al. but lower than the value found by Earl et al. Our values for reticulocytes, prothrombin time, and partial thromboplastin time were much lower than those of Earl et al., and our percentage of band neutrophils was higher. The leucocyte count was lower, and the percentages of eosinophils, basophils, and segmented neutrophils were higher than those of Earl et al. and Tumbleson et al. The percentage of monocytes was higher than the values reported by these authors while the percentage of lymphocytes was about midway between the values they reported.

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[3] Spector, W. A. 1956. Handbook of biological data, pp. 275-276. W. B. Saunders, Philadelphia.

[4] Earl, F. L., Melveger, Barbara E., Reinwall, J. E., and Wilson, R. L. 1971. Clinical laboratory values of neonatal and weanling miniature pigs. Lab. Anim. Sci. 21: 754. Tumbleson, M. E., Badger, T. M., Baker, Patricia C., and Hutcheson, D. P. 1972. Systemic oscillation of serum biochemic and hematologic parameters in Sinclair (S–1) miniature swine. J. Anim. Sci. 35: 48.

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